

New  
Specification



*Rewarding Learning*

**General Certificate of Secondary Education  
2018**

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## **GCSE Physics**

Unit 1  
Higher Tier

**[GPY12]**

**FRIDAY 15 JUNE, MORNING**

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# **MARK SCHEME**

## **General Marking Instructions and Mark Grids**

### ***Introduction***

Mark schemes are intended to ensure that the GCSE examination is marked consistently and fairly. The mark schemes provide markers with an indication of the nature and range of candidates' responses likely to be worthy of credit. They also set out the criteria that they should apply in allocating marks to candidates' responses. The mark schemes should be read in conjunction with these marking instructions.

### ***Quality of candidates' responses***

In marking the examination papers, examiners should be looking for a quality of response reflecting the level of maturity which may reasonably be expected of a 16-year-old which is the age at which the majority of candidates sit their GCSE examinations.

### ***Flexibility in marking***

Mark schemes are not intended to be totally prescriptive. No mark scheme can cover all the responses which candidates may produce. In the event of unanticipated answers, examiners are expected to use their professional judgement to assess the validity of answers. If an answer is particularly problematic, the examiners should seek the guidance of the Supervising Examiner.

### ***Positive marking***

Examiners must be positive in their marking, giving appropriate credit for description, explanation and analysis, using knowledge and understanding and for the appropriate use of evidence and reasoned argument to express and evaluate personal responses, informed insights and differing viewpoints. Examiners should make use of the whole of the available mark range of any particular question and be prepared to award full marks for a response which is as good as might reasonably be expected of a 16-year-old GCSE candidate.

### ***Awarding zero marks***

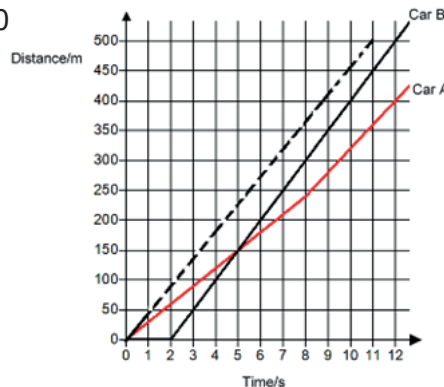
Marks should only be awarded for valid responses and no marks should be awarded for an answer which is completely incorrect or inappropriate.

### ***Types of mark scheme***

Mark schemes for questions which require candidates to respond in extended written form are marked on the basis of levels of response which take account of the quality of written communication.

Other questions which require only short answers are marked on a point for point basis with marks awarded for each valid piece of information provided.

- 1 (a) (i) 100 (m) [1]
- (ii) 5 (s) [1]
- (iii) (Average) speed = distance/time =  $500/10$   $50/12 = 41.67(42)$  [2]  
 $= 50$  (m/s) award [2]/[3] [1] [3]
- (iv) Straight line starting at 0,0  
 ending at 11, 500 [1]



- (b) (i) Measure the interval between each 1 m  
 If it is getting shorter the ball is accelerating [1] [2]
- (ii) Repeat the timings **and** average [1]
- (c) (i) 1 (s) [1]
- (ii) (Distance) = area under graph [1]  
 $= \frac{1}{2} \times 8 \times 1 + 4 \times 1 + \frac{1}{2} \times 3 \times 4$  or  $4 + 4 + 6$  [1]  
 $= 14$  (m) [1] [3]  
 26m is worth [1]
- (iii) The gradient changes or is not a straight line  
 changes of steepness [1]
- (d) (i) Average velocity =  $\frac{\text{initial} + (\text{final velocity})}{2}$  [1]  
 $\frac{(0 + 28)}{2}$  [1]  
 $= 14$  (m/s) [1] [3]
- (ii) Time = Distance/speed [1] or  $T = \frac{d}{v}$  [1] [2]  
 $= 70/14$  [1] [1] [3]  
 $= 5$  (s) [1]  
 ecf from (i)
- (iii)  $v = u + at$  or equivalent [1]  
 Acceleration =  $(28 - 0)/5$  [1]  
 $= 5.6$  (m/s<sup>2</sup>) Allow ecf for time from (ii) [1]  
 ignore minus [3]

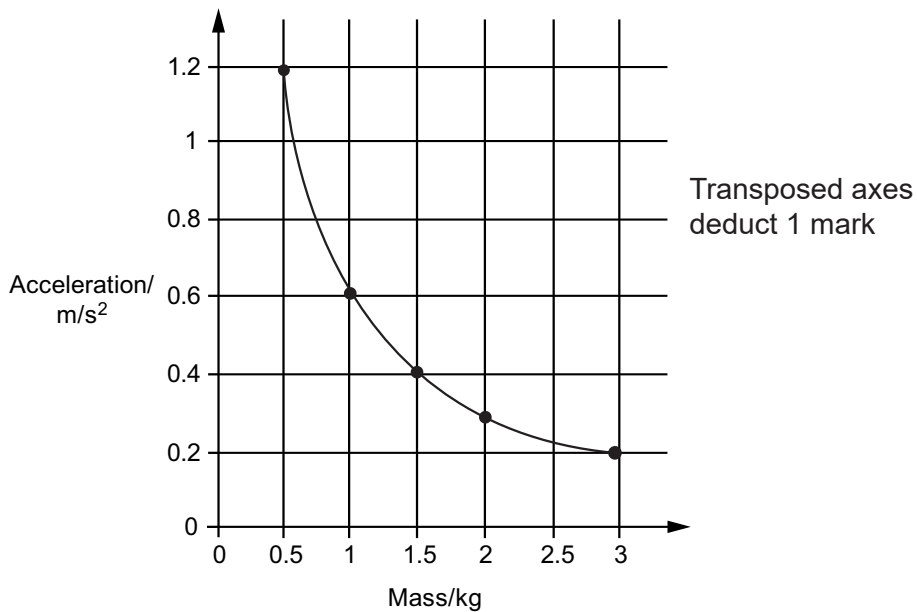
AVAILABLE  
MARKS

24

- 2 (a) (i)  $F_R$  Resultant force =  $1250 - 250 = 1000$  (N) [1]  
 $F = ma$  [1]  
 $1000 = 750 \times a$  [1]  
 $a = 1.33$  ( $\text{m/s}^2$ ) or 1.3 or  $1\frac{1}{3}$  or  $\frac{4}{3}$  [1] [4]

(ii) The mass is less/fuel has been used/downhill [1]

- (b) (i) Both axes labelled [1]  
with units [1]  
Four points plotted ( $\pm 1$  div) [1]  
Consistent with the smooth curve – joining dots – give [0] [1]  
Good scale, at least half the grid on both axes [1]  
Transposed axes [-1] [5]



(ii)  $ma = \text{constant}$  [1]

- (c) (i) 1N causes an ext = 4 cm [1]  
Unextended length =  $10 - 4 = 6$  cm [1] [2]

(ii)  $F = ke$  or  $1 = k \times 4$  [1]  
 $k = 0.25$  [1]  
Unit N/cm [1] [3]

(iii)  $F = 0.25 \times 10$  allow ecf from (ii) [1]  
= 2.5 (N) [1] [2]

- (d) (i)  $CM = ACM$  or  $F_1d_1 = F_2d_2$  [1]  
 $25 \times 35 = F \times 5$  [1]  
 $F = 175$  (N) [1] [3]

(ii)  $P = F/A$  or  $F = PA$  [1]  
 $F = 36 \times 5$  [1]  
= 180 (N) [1] [3]

AVAILABLE MARKS

24

<b>3 (a) (i)</b>	(85 g) given 50 cm <sup>3</sup> 125g 40 g	[ $\frac{1}{2}$ ] each round up			
			[2]		
<b>(ii)</b>	D = M/V	No ecf from (i)	[1]		
	= 40/50		[1]		
	= 0.8	4/5	[1]		
	g/cm <sup>3</sup> or kg/m <sup>3</sup> – must be consistent with number		[1]	[4]	
<b>(iii)</b>	Read to (bottom of) meniscus/or to eye level bottom of the curve			[1]	
<b>(b)</b>	In water molecules slide past each other/or move around/freely/ move in all directions [1]				
	In glass the molecules vibrate in fixed positions				
		[1] [1]		[3]	
<b>(c)</b>	0°C to 4°C	volume DECREASES	[1]		
	4°C to 80°C	volume INCREASES	[1]	[2]	

AVAILABLE MARKS
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4 (a) Indicative content

**Apparatus:**

Stopwatch/stopclock/timer measuring stick – [0]  
metre stick/rule(r)/tape measure

**Measurements:**

Height of staircase/height of riser and number of risers

Distance – [0] must be a vertical distance

or height of bench and number of step-ups

Time to run up stairs or time to complete step-ups

Horizontal distance – [0] and associated time – [0]

**Calculation:**

Work = weight × height or  $W = F \times D$

Power = work/time or  $W/t$

(Equations may be combined: power = weight × height/time =  $\frac{mgh}{t}$   
gets both points)

Response	Mark
Candidates describe in detail using good spelling, punctuation and grammar <b>at least 5</b> points shown above and the precaution is clearly stated. The form and style are of a high standard and specialist terms are used appropriately at all times.	[5]–[6]
Candidates describe in detail using good spelling, punctuation and grammar <b>3 or 4</b> points shown above. The form and style are of a high standard and specialist terms are used appropriately at all times.	[3]–[4]
Candidates make some reference to <b>1 or 2</b> of the main points shown above using satisfactory spelling, punctuation and grammar. The form and style are of a satisfactory standard and they have made some reference to specialist terms.	[1]–[2]
Response not worthy of credit	[0]

[6]

- (b) Tidal power            Renewable  
Biomass                    Renewable  
Wind power                Renewable  
Nuclear power            Non-renewable

$[\frac{1}{2}]$  each round up

[2]

- (c) Chemical → Electrical

[1]



Light Sound/Heat or Vibrational/or kinetic

[1]

[2]

must

- (d) Efficiency = useful output/total input

[1]

= 60/100 = 144/240

[1]

= 0.6 or 60%

[1]

[3]

any unit following 0.6 award [2]/[3]

- (e) (i)  $E_p = mgh$  [1]  
 $= 1200 \times 10 \times 40$  [1]  
 $= 4.8 \times 10^5$  (480 000) (J) or 480 kJ [1] [3]
- (ii)  $E_k = \frac{1}{2}mv^2$  reverse calculation is worth [3] [1]  
 $2.4 \times 10^5 = \frac{1}{2} \times 1200 \times v^2$   $\frac{1}{2} \times 1200 \times v^2 = 2.4 \times 10^5$  [1]  
 $v^2 = \frac{2.4 \times 10^5}{600} = 400$  [1] [3]
- (iii)  $2.4 \times 10^5 = \text{Force} \times \text{distance}$  or Work = Force  $\times$  distance [1]  
 $\Delta KE = \text{Force} \times \text{distance}$   
Force =  $2.4 \times 10^5 / 30$  [1]  
= 8000 (N) [1] [3]
- Alternative Ave. vel. =  $\frac{20}{2} = 10$  Time to stop =  $\frac{30}{10}$  } [1]
- $a = \frac{v-u}{t} = \frac{20}{3}$  [1] = 6.7 F = ma =  $1200 \times 6.7 = 8000$  [1]
- (f) (i) Both upward curves/lines start at the same point – at end of line shown and copper above glass [1]
- (ii) Electrons gain energy [1]  
(Transfer the energy by) collisions with atoms/ions/particles [1] [2]

AVAILABLE  
MARKS

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5 (a) Half-life = 1.4 to 1.6 award [1] for evidence of halving [2]  
 1.3 or 1.7 give [1] only

(b) **Indicative content**

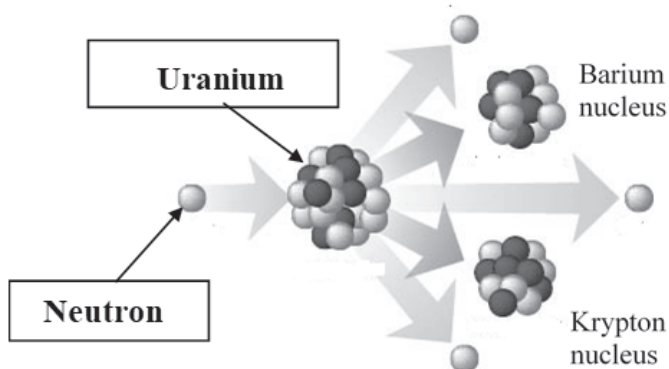
Gamma ray or beta source because  $\gamma$  rays unaffected by aluminium  
 Alpha – [0]  
 Only one that penetrates the aluminium  
 Long half-life – e.g. several years  
 So its activity remains constant/Source not changed often  
 As the count rate decreases pressure (force) is increased } or converse  
 To make metal thinner

Response	Mark
Candidates describe in detail using good spelling, punctuation and grammar <b>at least 5</b> points shown above and the precaution is clearly stated. The form and style are of a high standard and specialist terms are used appropriately at all times.	[5]–[6]
Candidates describe in detail using good spelling, punctuation and grammar <b>3 or 4</b> points shown above. The form and style are of a high standard and specialist terms are used appropriately at all times.	[3]–[4]
Candidates make some reference to <b>1 or 2</b> of the main points shown above using satisfactory spelling, punctuation and grammar. The form and style are of a satisfactory standard and they have made some reference to specialist terms.	[1]–[2]
Response not worthy of credit	[0]

[6]

(c) (i) Neutron [1]

Uranium or thorium or plutonium or proton [1] [2]



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(ii) Kinetic energy (of smaller nuclei)/heat [1]

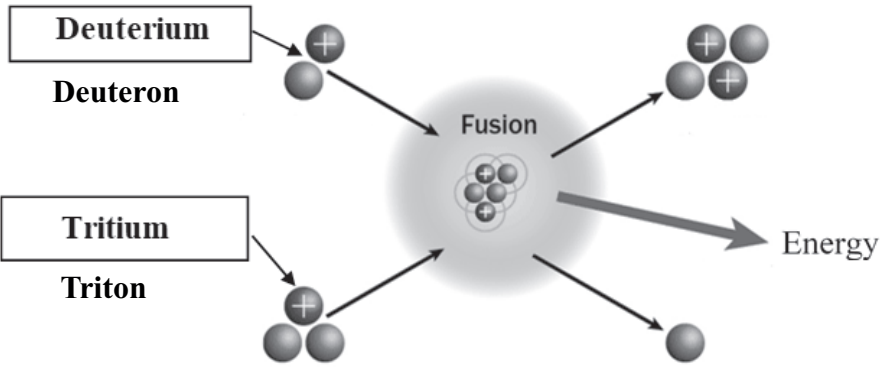
(iii) extra/more/further/fission/neutrons [1] released cause further fissions/  
 collisions absorbed by other nuclei/reactions (of uranium) [1] [2]

(d) Deuterium  
Tritium

[1]

[1]

[2]



Do not accept  ${}^3_1\text{H}$  or  ${}^2_1\text{H}$

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**Total**

**AVAILABLE  
MARKS**

15

**100**